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HUMAN ILLNESSES IN EMPLOYED PERSONS ATTRIBUTED TO EXPOSURE TO PESTICIDES
CONTAINING METHYL BROMIDE WITH EMPHASIS ON CASES REPORTED BY
PHYSICIANS IN CALIFORNIA IN 1975 --
WHY EXPOSURES OCCURRED AND SUGGESTIONS FOR REDUCING THE NUMBERS
OF EXPOSURES

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SUMMARY

Methyl bromide is an effective, low cost, efficient fumigant especially useful for control of nematodes, fungi and weed seeds in soil, insects and rodents in grain and commodities, and termites in structures. Several million pounds are used each year in California. It is highly toxic to man and must be used with great care. Extensive use experience has resulted in a body of safe use information. Most applications are properly made without excessive exposure. Occupational deaths have been avoided in recent years but about 30 cases of occupational illness are reported each year from exposure to this pesticide. Some of these persons are left with permanent damage to the eye, brain, and sometimes to other tissues. Seventy-seven labels of products containing methyl bromide were reviewed and most were considered deficient in providing adequate safety information. Statements on the hazards of skin absorption were most notably lacking. It is recommended that consideration be given to limiting registration of methyl bromide products to those containing chloropicrin as a warning agent. This would require the establishment of additional exemptions or tolerances for chloropicrin on fruits, vegetables, and nuts.

INTRODUCTION

Methyl bromide is a colorless, nearly odorless gas which is applied as a pesticide from pressurized containers in which it exists in the liquid state. The boiling point is +3.5°C.

Products known to have been involved in human exposure incidents in California in 1975 include:

1. Brom-O-Gras (Great Lakes: EPA Reg. No. 5785-42) methyl bromide 98%, chloropicrin 2%;
2. Meth-O-Gas (Great Lakes: EPA Reg. No. 5785-11); methyl bromide 100%;
3. Meth-O-Gas (Great Lakes: EPA Reg. No. 5785-41); methyl bromide 100%;
4. Terr-O-Gas (Great Lakes: EPA Reg. No. 5785-40); methyl bromide 75%, chloropicrin 25%;
5. Dowfume MC-33 (Dow Chemical: EPA Reg. No. 464-303); methyl bromide 67%, chloropicrin 33%;
6. Dowfume MC-2 (Dow Chemical: EPA Reg. No. 464-104); methyl bromide 98%, chloropicrin 2%;
7. Methyl Bromide 98% (Soil Chem. Corp.: EPA Reg. No. 8536-50013); methyl bromide 98%, chloropicrin 2%; and
8. Namco: Methyl Bromide (Namco: EPA Reg. No. 5316-41); methyl bromide 100%.

Methyl bromide is a general-purpose fumigant used primarily for soil fumigation to control nematodes and weed seeds. It is also used as a commodity fumigant to control pests on grains, nuts, vegetables, and indoor plants, and to fumigate structures infested with insects.

Methyl bromide is applied to the soil as a gas either by injection into the soil or by release under tarps above the surface of the soil. In most applications, the soil is covered with a tarp to prevent premature escape of the gas. Commodities are most often fumigated in a fumigation chamber. Granaries, trucks, ships, and structures may be fumigated under a tarp.

7,164,324 pounds of methyl bromide were reported used in California in 1975.

The major uses were: (1) Agricultural soil fumigation, 6,094,244 lbs.; (2) potting soil fumigation, 619,931 lbs.; (3) commodity fumigation (includes grain, fruit and nuts), 65,183 lbs.; (4) structural fumigation, 112,113 lbs.; and (5) other uses, 272,789 lbs.

Typical application rates in soil are .002-.01 lbs/ft² of surface area or 100-400 lbs/acre, in bulk grain 2-4 lbs/1,000 ft³, and as space fumigant 1-3 lbs/1,000 ft³.

Since methyl bromide is almost odorless except in high concentrations, about 90 percent of the pesticides that contain methyl bromide are applied with chloropicrin added, usually to provide a safety warning. Pure methyl bromide is used principally in commodity fumigation; such as fruits and nuts since tolerances for chloropicrin for these items have not been set. Chloropicrin -- which is essentially tear gas -- is usually used in low concentrations to warn persons of leakage of the nearly odorless methyl bromide during application and also to prevent exposure to methyl bromide before it has dissipated. The quantity of chloropicrin added to pesticides that contain methyl bromide ranges from as low as 0.25 percent up to 67 percent. In higher concentrations chloropicrin is also an effective fumigant. Most products as presently marketed contain from 0.25 percent to no more than 5 percent with the trend towards decreasing amounts. However, even one or two percent chloropicrin can be toxic to plants and to man, so care must be taken with its use. Exposure of man to high concentrations of chloropicrin will warn the exposed individual, but may also render him incapable of removing himself from exposure.

The danger of applying methyl bromide without chloropicrin is indicated by a study of the human exposure incidents that occurred in 1975. Of 20 exposure incidents reported in which the exact pesticide that contained methyl bromide was known, eight (40%) were caused by pesticides that contained only methyl bromide even though application of pure methyl bromide as a pesticide accounts for only about ten percent of the total usage of methyl bromide. The addition of small quantities of chloropicrin as a warning agent should help to reduce the number of exposures resulting in illness. As little as 0.25% will suffice for this purpose.

The LC_{50} of methyl bromide in rats is 1,000 ppm. The threshold limit value is 15 ppm in air. Acute vapor toxicity occurs with exposure at levels above 200 ppm. Exposure to levels of 2,000 ppm can be fatal in one hour. In addition to being inhaled in gaseous form, methyl bromide in liquid or gaseous form can cause surface chemical burns to the skin and diffuse rapidly through the skin to enter the circulatory system. In the body it may cause severe lung irritation and cumulative damage to the heart, kidneys, and nervous system. Illnesses resulting from methyl bromide exposures may have a latency period before onset from a few hours to as long as three days. One particularly hazardous characteristic of methyl bromide lies in the fact that it is much more dense than air. A worker may therefore be exposed to hazardous levels via the skin on his legs and feet, and not be aware of it. In addition, if a canister gas mask or a self-contained air-supplied mask is used, the worker may not understand that the fumigant is passing through his skin. The gas mask can thus give a false sense of security.

OCCUPATIONAL ILLNESSES DUE TO EXPOSURE TO METHYL BROMIDE IN 1975 IN CALIFORNIA

A total of 30 physician's reports of presumed occupational overexposure to pesticides containing methyl bromide were reported in 1975. Of these, the majority were due to uncoupling or breakage of hoses holding the gas under pressure, improper application techniques, or premature removal of tarps from treated areas.

Ten cases involved uncoupling or breakage of pressurized hoses that released the fumigant to the working environment. Most of these could have been prevented by precautionary safety inspection of equipment. Employers are responsible for the maintenance of safe equipment. Not all these exposure incidents were due to equipment failure or human error, additional diligence in employee safety supervision is required.

Three incidents accounted for seven cases of exposure during tarp removal. All involved eye irritation and all involved fumigants containing chloropicrin. This indicates that these symptoms seen may have been due primarily to chloropicrin and not the methyl bromide. While it is possible that only chloropicrin appeared to induce symptoms, workers should be instructed that it is added so as to warn of the presence of methyl bromide. Therefore, additional aeration should be allowed if chloropicrin is detected. Merely putting on a gas mask to avoid chloropicrin exposure or methyl bromide inhalation will not prevent skin absorption.

Five of the exposure cases involved accidents during application. These included changing methyl bromide canisters before the old one was completely exhausted, misdirection of spray, and exposure of persons not working as applicators during the application. All of these cases could have been prevented by care in following strict safety routines.

Types of Exposures Reported by Physicians in California in 1975

| | |
|-----------------|-----------|
| Systemic Injury | 16 |
| Eye | 7 |
| Skin | 3 |
| Eye and Skin | 1 |
| Exposed Not Ill | 3 |
| Total Cases | <u>30</u> |

Reasons for Exposure Incidents in 1975

| | |
|------------------------------|-----------|
| Hose Release | 10 |
| Tarp Removal | 7 |
| Application Accident | 5 |
| Handling Fumigated Materials | 3 |
| Disposal | 2 |
| Handling Fumigant | 1 |
| Reentry | 1 |
| Accidental Valve Opening | 1 |
| Total | <u>30</u> |

Summaries of Cases of Occupational Exposure Incidents Involving Methyl Bromide in California in 1975

Two machine repairers were cleaning a fumigating machine when a hose containing Terr-O-Gas released and sprayed the pesticide on the workers' eyes and faces.

A part-time warehouseman was unloading a boxcar containing bagged, hulled rice which had been treated with methyl bromide 13 days previously. He experienced

difficulty in breathing and had a cough for one day. The car had been allowed to ventilate for six hours prior to unloading. The worker and investigator both thought it possible that a "white dust" laying on the bags caused the respiratory problem; however, methyl bromide was reported as the probable cause by the physician.

A field fumigator was applying methyl bromide manufactured by Soil Chemicals Corp. to a peach orchard when an accident resulted in the application of the gas to his shoe. Although he felt a "cold" sensation, he continued working through the day. Later on, his foot turned red and became painful. At this time he informed his employer and he was taken to a hospital emergency room. When interviewed, he said he thought that there should have been more information on the label pertaining to safe use and protective equipment.

A fumigator working in a nursery with Brom-O-Gas received methyl bromide burns on his face and arm. The incident apparently occurred as a result of an obstruction in the polyethylene tubing of the dispenser causing it to burst. He was not wearing any protective equipment while attempting to clear the tubing. The employer said that he thought the obstruction was a manufacturing defect. The investigator stated that the safety precautions were not clearly printed on the label.

A structural pest control worker complained of weak legs and hands as well as aches and muscle cramps all over. His physician said it was a result of methyl bromide exposure. The employer stated the employee had a history of skin sensitivity and was careless in following safety procedures. It is possible that this case followed several days of excess exposure.

A worker loading methyl bromide cylinders manufactured by Great Lakes Chemical Corp. onto a trailer for use in the field accidentally opened a valve on one cylinder which resulted in a spill on his shoe. He suffered no effects until that night when he experienced a burning sensation in his foot. He then apparently waited six days before visiting a physician, at which time he had second degree burns over a five square centimeter area of his right foot. Upon investigation, it was found that the required soap, water, and towels had not been provided at the work site.

A fireman with the State Division of Forestry was called to the county dump to investigate a leaking methyl bromide cylinder. While working in the vicinity, some of the gas was inhaled. The examining physician did not report the presence or absence of symptoms.

Two fumigators were operating a fumigation chamber when a leak developed in a coupling in the pesticide delivery system. One of the men tried to fix it before shutting off the system. While attempting to fix the leak, the coupling came apart completely. One man went for gas masks while the other tried to fix the hose. The man who stayed experienced a headache and was taken to a hospital emergency room where he was treated.

A nursery worker was working in a greenhouse with potting soil which had been treated with Brom-O-Gas. According to the employer, it had been allowed to air out for the required length of time. She inhaled the methyl bromide and was subsequently taken to a hospital emergency room because of symptoms of

nausea and dizziness. As a result of this inhalation exposure, the patient was hospitalized for a few days and removed from work for two weeks.

Four employees of the City of Garden Grove involved in removing a tarp from a fumigated strawberry field experienced nausea after approximately three hours of work. The tarp, covering about one acre, had been well sealed and in place for 48 hours. The fumigant contained one percent chloropicrin which was noted shortly after removing the tarp. After complaining to the foreman, they were instructed to change clothes and report to a doctor. The employer stated that standard work procedures had been followed and that they hadn't experienced this type of human illness problem previously. He did say, however, that in the past workers have often complained of the musty odor, "but only as an odor nuisance." The investigator said he thought that the "nausea was induced from the smell of chloropicrin and fear of the unknown potential of the gas." While the investigator's opinion may be well-founded, there is nothing in the doctor's report to substantiate it. What is of concern is the supervisor's statement that odor complaints are common. If the same workers engage in this activity often, they may be exposing themselves to excess levels of methyl bromide.

A mushroom farm worker entered a room which had been fumigated with Namco Methyl Bromide three days earlier. There were two forklifts being driven in the room where he worked with eight other employees. The employer stated that the filters used in the room's ventilation system were too restrictive and he believed the illness, systemic in nature, had been caused by carbon monoxide. This, however, is questionable; the illness was probably caused by methyl bromide. The employer now uses less restrictive air filters.

A welder preparing to repair equipment dragged electrical leads across some valves opening one and releasing methyl bromide, Great Lakes Chemical Corp., to the surrounding atmosphere. He experienced dizziness and went to a hospital emergency room where a bromide blood level test was made. The patient's level was 1.1 ppm as compared to a normal range which is 0.8 to 1.5 ppm. Both employee and employer agreed that this was a freak accident, avoidable only by greater care. The investigator thought that the employee had been adequately informed of the hazards involved as well as the precautions to be taken.

An indoor worker in a warehouse containing bags of milk which had been fumigated noticed some burning of his eyes. The next day he became "sick" but symptoms were not detailed. The employee was working with seven other men who noticed some eye irritation in areas with no air movement. The employee was the only one of the eight to complain of a continued systemic illness problem. The employer said that the employee has a history of what seems to be "induced" or "imagined" illness. The employer stated that the worker was about to be discharged and was looking for an excuse to take sick leave and stay on the payroll as long as possible. The investigator seemed to agree.

A fumigator was handling two cases of rusty, discarded methyl bromide canisters. Some of the gas escaped, getting into his eyes. His eyes were irrigated, examined, and treated by a physician. No safety equipment had been used. Had a mask been used, it probably would have prevented this incident. Also, greater care should have been taken in the handling of the discarded methyl bromide containers.

A fumigator received a chemical burn on his hand from spillage which occurred while changing canisters on the dispenser gun. The old canister was not fully exhausted and some backflow from the dispenser system came into contact with his hand during removal. Dowfume MC2 was being used to control gophers. The firm using it stated they were not aware that Dowfume is not registered for the use as a rodenticide. When the investigator informed them of this, they said they would stop using it for this purpose.

A nursery worker while removing the covering tarps from fumigated potting soil became exposed to Dowfume MC2 and experienced some eye irritation. Details of this case are not available but it appears no eye protection was used.

Two workers engaged in removal of the tarps from fumigated tomato bins suffered eye irritation from fumes from Dowfume MC33. The workers noticed the chloropicrin but continued working without realizing that they might be exposing themselves to methyl bromide. It is possible that the toxic effects may have been due solely to chloropicrin.

A worker was reading a pressure gauge when a high pressure hose containing Meth-O-Gas ruptured. The liquid spurted in his face. He flushed his eyes with water and neutralizer for 15 minutes before going to a physician. The employer stated that the hoses would be replaced more frequently in the future. This incident might have been prevented had a gas mask been worn and the equipment had received periodic checkups.

A maintenance employee was sprayed with Dow Methyl Bromide as a result of a broken hose connection. The employee was wearing full protective equipment and as a result experienced no toxic effects.

A worker operating a fumigatorium was applying Meth-O-Gas via a pipe through the wall to the chamber. Upon opening the valve at the cylinder, the pressure from the hose dislodged the pipe from the wall. He shut it off as soon as possible, but he nevertheless inhaled enough methyl bromide to make him sick. The employee, with several years of experience with methyl bromide, stated that he would use respiratory protection in such situations in the future.

A nursery worker who was not authorized by his employer to handle chemicals came in contact with Dowfume MC2 while using it. As a result he suffered burning and itching of the eyes, along with chest tightness and mild bronchial irritation. Employee supervision was definitely lacking and was probably the main cause of the incident.

An indoor worker inhaled Meth-O-Gas when a nearby hose connection leaked and some of the gas escaped. Exposure lasted several minutes while the employee attempted to tighten the connection. This incident might have been avoided if the firm had followed a regular equipment inspection procedure.

A fumigation worker applying Terro-O-Gas received eye irritation as a result of a broken hose connection. When the hose broke, the employee's body was covered with a large amount of the liquid. He had only mild eye irritation as a result of wearing protective clothing. The investigator stated that improvements have been made in application equipment to prevent further

mishaps. Regular equipment inspection by the employer might have prevented this.

A ground applicator had methyl bromide gas make contact with his eyes as a result of applying the fumigant to soil that was not well worked into fine particles. The supervisor said the chemical came up out of the hard soil into the applicator's eyes. The investigator thought this was probably a freak accident "with the chance of a repeat of the accident very unlikely." He went on to recommend that eye protection be provided by the employer. Had the employee been wearing eye protection, this exposure probably would not have occurred.

Discussion

The 30 human exposure cases in employees discussed above are typical for those which have occurred in recent years. There were 28 cases in 1974 and similar numbers in other recent years. There were six occupational fatalities and sizable numbers of recovered cases of overexposures that were left with serious permanent effects during the decade of the 1950's. Improved safety and regulatory programs appear to have minimized excessive exposure in recent years since fatalities are apparently not occurring and fewer life-threatening exposures are being seen even though total usage has increased considerably.

Of the incidents which still occur, there is often a finding of inadequate training, supervision, or availability of printed information on safe handling. All 77 labels of pesticides that contain methyl bromide that are currently registered for use in California were reviewed for adequacy of safe use instructions. Based upon the evaluation of 165 human occupational exposure incidents that occurred in California in 1971-75 that were studied by the authors, it is concluded that none of these labels adequately describe the hazards from skin absorption. The Dow Chemical Company had some of the best wording on this subject in its labeling. It is to be admitted that the one-pound containers often used have limited space, making it difficult to place all the necessary information on the product label. In several of the situations of misuse, the supplemental literature (labeling) in the packing cases that hold the one-pound containers was said not to have been received by the ultimate user. Some of the supplemental labeling honestly assesses the hazards of misuse while other labeling literature minimizes or fails to mention several important safety principles. The California Department of Health and the California Department of Food and Agriculture determined it was desirable to issue information sheets to summarize safety information often missing from some labels. (See attached information sheets.)

It is recommended that in the registration review process that all the labels and labeling on products that contain methyl bromide be reviewed to correct certain current common deficiencies:

1. Most labels fail to make it apparent that there is a serious risk of absorbing up to fatal amounts of liquid methyl bromide when spilled on the skin, even though the label instructions on wearing a black canister gas mask or an air-supplied face mask are carefully followed.

2. Most labels do not refer to the problem of methyl bromide layering out in low areas in highly toxic concentrations.
3. Labels should stress that methyl bromide must be kept within confined spaces, and then, thoroughly planned and adequate ventilation procedures must be followed before workers reenter fumigated areas. Halide leak detectors should not be overrelied upon as they often are not positive until levels well above the threshold limit values are reached. Work procedures should be planned so that gas levels are so low that gas masks are not needed. Gas masks should only have to be available for emergency short-time use.
4. Labels should not stress that gas masks are to be put on when chloropicrin is noted and then imply that routine work may proceed. Under these circumstances, chloropicrin then ceases to be a warning agent and skin absorption of methyl bromide is occurring.
5. More stress needs to be placed on the need for water to be immediately available for washing should liquid methyl bromide be sprayed into the eyes or on the skin. Permanent eye damage and severe skin damage and subsequent systemic absorption must be avoided.
6. Labels should stress that up to fatal doses of methyl bromide can be absorbed from a single exposure or from several lower level cumulative exposures without symptoms becoming evident for several hours or days. In California, some cases of onset of illness off the job have resulted in incarceration for presumed: marijuana intoxication, alcohol intoxication, and sudden onset of insanity.
7. Return of used containers or proper disposal must be stressed. Accidental release of methyl bromide from an abandoned container in Belmont, California, in 1973 resulted in severe lung damage and other systemic effects including some permanent central nervous system damage in several of 24 exposed firemen attempting to move the container that was emitting methyl bromide in the gaseous form. Some were affected even though they were wearing chemical protective sealed suiting and supplied air masks.

OCCUPATIONAL HEALTH HAZARDS
OF EXPOSURE TO 1,3 DICHLOROPROPENE

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HS-232

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Report Entitled:
Occupational Health Hazards
of Exposure to 1,3-Dichloropropene

May 21, 1976

OCCUPATIONAL HEALTH HAZARDS
OF EXPOSURE TO 1,3-DICHLOROPROPENE

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SUMMARY

The chemical, 1,3-dichloropropene, is an active ingredient of a number of agricultural pesticides used as fungicides and nematocides. Several million pounds are injected into the soil of several thousand acres of fields in California and throughout the world each year. Skin and eye contact with this chemical can and does result in severe irritation reactions in exposed persons. Inhalation can lead to anesthesia, chemical pneumonia, and pulmonary hemorrhage. It appears that very substantial skin and/or inhalation exposure under special circumstances such as occur following an accidental spill can also lead to effects upon the central nervous system resulting in severe headaches, irritability, easy fatiguability, anxiety, hyperactivity, fearfulness, loss of sex drive, and other behavioral changes. It appears that the hazards of use and how to avoid them need to be more explicitly described on the pesticide labels. It appears that State and Federal Department of Transportation regulations may need amendments to more adequately reflect the high hazard of exposure to this chemical by inhalation and skin contact. Present regulations and label instructions appear to be based only upon the lower hazard of oral ingestion and flammability.

INTRODUCTION

The chemical, 1,3-dichloropropene, is known to cause skin and eye irritation on direct contact, and pulmonary damage upon inhalation, but nothing has been reported in the literature concerning its acute and delayed toxic effects on the central nervous system. The chemical structure of the compound, 1,3-dichloropropene, suggests that it would have anesthetic properties; and one author (Dr. Peoples) synthesized it in 1933 along with similar chlorinated hydrocarbons, to evaluate it as a possible anesthetic. Tests with this substance proved that the anesthetic dose also caused death in the animals due to lung irritation and it was quickly abandoned as a practical anesthetic agent. The work was not published.

The chemical, 1,3-dichloropropene, is an effective pesticide ingredient, particularly as a nematocide and it is injected into soil prior to planting a number of crops. It is used in large quantities in California and is present in significant quantities in 56 different pesticides that were registered for use in California in 1975. Human illnesses of all types reported in California in 1974 and 1975 due to exposure to pesticides that contain this chemical involved only: D-D, Telone, Telone C, and Telone II. Apparently central nervous system damage occurred in one person following spill of one pint of Telone on his sleeve and arm in 1972 and to a number of persons following exposure to a large highway spill of Telone II in 1975.

The general effects of this chemical on the skin, eyes and lungs will be briefly described.

The two spills causing human exposure to Telone and Telone II with possible central nervous system effects will be reviewed in depth in this report to determine if those exposed have suffered acute or chronic damage to the nervous system and if so, how can such exposures be prevented.

COMPOSITION AND PHYSICAL PROPERTIES OF A TYPICAL
PESTICIDE CONTAINING 1,3-DICHLOROPROPENE

Composition

| | |
|----------------------------|------------------|
| Cis-1, 3-dichloropropene | 54% (B.P. 105°C) |
| Trans-1, 3-dichloroprepene | 29% (B.P. 112°C) |
| Trans-2, 3-dichloropropene | 9% |
| Trans-2, 2-dichloropropane | 7% |
| Epichlorhydrin | <u>1%</u> |
| | 100% |

Physical Properties

| | |
|------------------------|-------|
| Boiling point | 109°C |
| Vapor pressure at 20°C | 33mm |
| Density | 1.22 |
| Vapor Density | 3.83 |
| Flash Point | 70°C |

It is inflammable yielding HCl. Under certain circumstances, heat will cause the formation of phosgene.

TOXICITY STUDIES

Studies by Dow Chemical Company of single exposures of male rats to the vapors of 1,3-dichloropropene were conducted from levels of 9,700 ppm down to 700 ppm. All rats died when exposed for more than an hour to levels above 1,000 ppm. At 700 ppm for two hours, although death did not occur, severe lung hemorrhages and moderate liver damage was observed in exposed rats. The Dow Chemical Company concluded that "1,3-dichloropropene presents a definite hazard from inhalation. Concentrations capable of causing death or serious injury in a few minutes are readily attained at room temperature. Design of equipment and procedures must be such that exposure cannot occur. The material has a moderate acute oral toxicity and is capable of causing severe damage to the eyes. It has a severe vesicant action upon the skin. Common type protective equipment, such as rubber gloves and vinyl boots are apparently readily penetrated by this material. Care must be exercised in selecting proper material." "At any time 1,3-dichloropropene contacts rubber or neoprene gloves, they should be removed and discarded. This material penetrates rubber and neoprene." "Polyethylene provides a good barrier. For field operations, cover shoes and hands with polyethylene bags."

Acute dermal toxicity studies by the Dow Chemical Company show that 1,3-dichloropropene is quite irritating to the skin, causing edema, redness and necrosis. When applied 24 hours under a cuff, as a 12.5% solution in propylene glycol, the material was absorbed through the skin of rabbits in lethal amounts with deaths occurring from doses of 125 to 250 milligrams per kilogram.

SUMMARY OF TOXICITY STUDIES
IN ANIMALS ON 1,3-DICHLOROPROPENE

Toxicity studies in animals conducted by Dow Chemical Company were in connection with their requesting registration of Telone and Telone II by the California Department of Food and Agriculture for use in California. The following data were taken from these reports:

Acute Oral Toxicity in Rats. Vehicle corn oil

| | | |
|-----------|----------|-------------------------------------|
| 250 mg/Kg | 0/2 died | lung hemorrhage, fatty liver |
| 500 mg/Kg | 2/2 died | severe lung hemorrhage, fatty liver |

Subacute Oral Toxicity in Rats (28 day) Vehicle not noted.

| | |
|----------|---|
| 30 mg/Kg | no deaths |
| 90 mg/Kg | no deaths, pathological changes in liver and kidney |

Subacute Oral Toxicity in Rats (90 day) Vehicle propylene glycol

| | |
|-------------|-------------------------|
| 10-30 mg/Kg | no deaths, no pathology |
|-------------|-------------------------|

Dermal Toxicity undiluted on rabbit belly

| | |
|--------------------|--|
| 1 hour exposure | -- severe edema and hyperemia, slight necrosis |
| 5 minutes exposure | -- severe edema, slight hyperemia, exfoliation |

Dermal Absorption 12.6% in propylene glycol on rabbit belly

| | | |
|-----------|----------|-----------------------------------|
| 500 mg/Kg | 2/2 died | skin badly burned, moderate edema |
| 250 mg/Kg | 1/2 died | skin burned |

Eye Irritation rabbit

Undiluted, unwashed Severe pain, severe conjunctival irritation,
corneal damage, no healing in a week

Undiluted, washed with water Slight pain, severe conjunctival
irritation, corneal damage with
healing in a week.

Inhalation - single exposure in rats

| | | |
|---------------|----------------|--|
| 2700-9700 ppm | 0.5 hr. | All died after removal |
| 1000 ppm | 2 & 4 hrs. | Immediate eye irritation, unconscious, all died after removal. Severe liver and kidney damage. |
| 1000 ppm | 0.5 - 1.0 hrs. | Drowsy, no pathology, no deaths |
| 700 ppm | 2 & 4 hrs. | Drowsy, eye irritation, lung hemorrhages, fatty liver, no deaths |

Conclusions

Pesticides containing 1,3-dichloropropene have a low acute and subacute oral toxicity. Dermal irritation is severe but passed DOT standards as being noncorrosive. Prolonged dermal contact with between 250 and 500 mg/Kg produces sufficient skin absorption to cause death to test rabbits. Those pesticides are a severe eye irritant, producing pain, inflammation and corneal damage unless washed out with water. Inhalation causes central nervous system depression from drowsiness to anesthesia, depending on the concentration. They are a severe irritant to the eyes and lungs which may develop hemorrhages.

USUAL PATTERN OF OCCUPATIONAL ILLNESSES
FROM EXPOSURE TO 1,3-DICHLOROPROPENE

Over the past six years, physician's reports to the Department of Industrial Relations of the State of California concerning occupational exposure to pesticides containing 1,3-dichloropropene have averaged about 10 to 15 cases per year. Thirty-three of the cases reported during 1974 and 1975 are summarized below:

Analysis of Physicians' Reports Filed During 1974 and 1975 on Pesticide Related Illnesses Due to Exposure to Pesticides Containing 1,3-Dichloropene (with the Sutter County October 1975 spill incident excluded).

| <u>Nature of Injury</u> | <u>Number of Cases</u> |
|-------------------------|------------------------|
| *Systemic (chest pain) | 6 |
| Skin irritation | 8 |
| Eye irritation | 10 |
| Skin and eye irritation | 7 |
| Allergy | <u>2</u> |
| TOTAL | 33 |

*These cases caused irritation of the nasopharynx without central nervous system effect.

THE SPILL INCIDENTS THAT APPEAR TO HAVE LED TO
CENTRAL NERVOUS SYSTEM EFFECTS IN SOME OF THE EXPOSED PERSONS

The balance of this report will focus on two pesticide spill incidents; one in 1972 and another in 1975 that appear to have resulted in effects upon the central nervous system of the persons exposed.

The Accidental Exposure of a Workman to Telone at the Pittsburg Plant of
The Dow Chemical Company

On November 16, 1972, a structural steel worker made accidental contact by his shoulder rolling open a tank drainage valve with a stream of about one pint of Telone coming from a pipe from a supply tank which saturated one sleeve. Without removing his contaminated clothing, he was taken to a hospital where he waited over an hour before being treated. He was found to have irritation of the skin, eyes and nose. He was never unconscious, and had normal sensory and reflex activity. Subsequently he was given extensive examinations including repeated liver and kidney tests, but all were negative except for an occasional cardiac arrhythmia which was not considered to be abnormal. He gradually, during the next several weeks, developed a change in personality in that he became anxious, fearful, and developed hyperventilation and sweating of the palms when under the slightest stress. A physician-toxicologist, examined him and found that this worker had feelings of depersonalization and anxiety but wasn't sure it was due to the effects of the Telone or fright due to the accident. Prior to the exposure, this worker had been considered an unusually fearless structural steel worker; after the incident he was afraid to stand on a chair or to be left in a room alone.

This steel worker was given an out-of-court settlement on October 28, 1975, but this apparently had little effect on his health. He has been examined by a psychologist who convinced him that his condition was nervousness and not due to the toxic effects of Telone. He soon lost faith in this advice after trying to go back to work. He was said to have shaken uncontrollably and to have sweat considerably when he tried to work again.

One of us, Dr. Peoples, had a telephone conversation with the steel worker's personal physician on April 23, 1976. The physician stated that the worker now considers himself completely disabled and has given up trying to get a job. He sits around the house doing nothing. He blames his condition, which is physical weakness and inability to concentrate, on the exposure to Telone. He states that his ability to perform sexually was eliminated by the Telone exposure. His wife says she does not think he will ever recover. His personal physician states that he is not sure now whether the exposure to Telone caused these adverse health effects by its toxic effects on the higher centers of the brain or triggered a psychological change that would have happened anyway.

The Telone II Spill Near Yuba City, California, on October 21, 1975

At 8:40 a.m. on October 21, 1975, eight miles west of Yuba City, California, there was a collision between a truck pulling a travel trailer and a truck tractor pulling a trailer carrying a tank containing about 1,200 gallons of Telone II. The tractor separated from the trailer and the tank broke loose from the trailer and ruptured, slowly pouring Telone II over the highway, the side of the road, and on the wreckage of

the travel trailer. Forty feet away, the truck tractor lay on its side on fire, but fortunately the inflammable liquid, Telone II, around the trailer did not ignite.

The California Highway Patrol (CHP) and the Yuba City and Sutter County fire departments responded to handle traffic, fight the fire, hose the Telone II from the highway, and to clear the wreckage. A Sergeant of the CHP then in charge could not identify the contents of the tank from the labels still visible on the wrecked vehicles, but was correctly informed by the truck driver that Telone II was the liquid being hauled. The Highway Patrol contacted Chemtrec through the Chico Dispatch Center at 9:02 a.m. and was told by Chemtrec that Telone II could cause skin irritation, dizziness and nausea, but that it was not a hazardous substance. It was not until 11:51 a.m. that the CHP received the information furnished by the Dow Chemical Company by telephone that Telone II could be dangerous on inhalation; full self-contained face masks were needed, that it attacked leather and rubber so that boots and shoes must be discarded after contact with the liquid and that the only resistant material to protect the skin was polyethylene.

By 11:61 a.m., five CHP had been exposed to the liquid and vapor without any protective clothing. The firemen had been wearing full protective clothing including self-contained face masks most of the time.

Whether due to penetration of Telone II through the rubber of the protective clothing, exposure of unprotected skin, or removal of the mask for some reason, such as empty air tanks, one fireman fell unconscious at 10:51 at the accident scene and had convulsions. At 11:54 a

second fireman and then a third fireman also fell unconscious and had convulsions at the accident scene. These three men were taken to the Sutter General Hospital for treatment. It was then recommended that all persons who had been at the scene of the accident should report to the Sutter General Hospital for examination.

The number of persons exposed was estimated at 80, but only 45 Pesticide Illness Reports were eventually received by the State Department of Health. One physician submitted (the first physician) 20 "outpatient" reports, and a second physician submitted 25 "inpatient" reports. Except for identifying the patient, the reports written by the second physician were identical: major signs and symptoms were listed as "respiratory distress, itching, nausea." Similarly, each of the first physician's reports listed under signs and symptoms "checked for symptoms."

In all, 21 cases were admitted to the hospital by both physicians and were treated with saline wash for eye irritation and soap and water shower for skin irritation. All cases were discharged on the following day with arrangements made for follow-up examinations. The CHP cases were then taken care of by a third physician and some others were cared for by other private physicians in the area.

Two of us (Dr. Peoples and William Thomas) interviewed the first physician on November 10, 1975, and learned that in the follow-up period two cases had skin rash of short duration, several had persistent headaches and that one case under the care of another physician had developed personality changes. This physician said that he planned more extensive tests on certain cases for liver and kidney function which

would be complete by November 17, 1975.

In a telephone call to the first physician on November 17, 1975, (by Dr. Maddy) it was learned that of 36 patients seen in a follow-up visit on November 10, 1975, 16 were released from further follow-up. This first physician stated that he expected to release 10 of the remaining patients after the November 17, 1975, checkup. He said the patients no longer had eye and lung irritation symptoms but complained of nervousness, headache, malaise, indigestion and dyspepsia. Not all persons had all these symptoms. This physician said that he thought that the unusual pattern of symptoms that these patients exhibited and described indicated to him that he was dealing with real symptoms of illness.

On April 8, 1976, one of us (Dr. Peoples) talked by telephone with the second physician at the Sutter General Hospital as the first physician had moved away and was by then practicing medicine in Atlanta, Georgia. This second physician said he was then taking care of the firemen, one State of California Department of Transportation employee, and one described as an "emergency service employee." As several lawsuits are pending, this second physician declined to name the patients he and other physicians were then seeing, but he did describe the current symptoms of certain of the patients:

1. Two patients then had abnormal audiograms with defective hearing. Prior tests taken while in the army were said to have been normal.
2. One patient had acute trigonitis (bladder irritation) that the urologist attributed to Telone II exposure.
3. Most of the cases (number not mentioned) still had persistent headaches, irritability, and easy fatiguability.

4. One fireman's wife said that her husband's behavior had changed since the Telone II spill in that he couldn't sit still, had become hyperactive, and continued to show symptoms of anxiety. He was said to have shown signs of recent improvement.

This second treating physician said that he planned to continue to follow ten exposed individuals.

We reviewed our records of how the firemen themselves felt about the Telone II exposure and how it appeared to affect their health.

On December 11, 1975, we (William Thomas) conferred with the two senior firemen for Sutter County. Both men were said to have suffered the greatest exposure to Telone II at the scene of the accident, and both men said they still had symptoms of poisoning at that time. They said initially all the firemen exposed at the scene suffered skin rashes, anxiousness and irritability which was by then much less evident. They said ten men were having severe headaches and one man, a diabetic, was having serious fluctuations in his blood-sugar level.

On January 7, 1976, we (William Thomas) spoke to one of these senior firemen by telephone and was told that eight firemen still had moderate to severe headaches. He also said that he himself was being seen by the second physician because of a return of his nervousness. He said that this physician had recently also called in a California Department of Transportation employee who had been exposed at the spill scene because he had been showing symptoms of impairment of equilibrium on the job.

On April 8, 1976, we (Dr. Peoples) talked to one of these senior firemen who then told him that several firemen were still under the care of the second physician for "symptoms" which he declined to describe in more detail. He then gave the following account of his own health on that date:

1. He had experienced continuous headaches since the day of the accident.
2. He said he continued to feel "shaky, nervous and irritable." Tranquilizers gave temporary relief and he said that he "didn't want to depend on them the rest of his life."
3. He said that he "didn't have his previous stamina" and that he tired out when fighting fires as compared to good health prior to the Telone II exposure.
4. He said he had become intolerant of much smoke which recently had caused breathing difficulties at many recent fires due to a sensation of irritation in his chest.

He said that his assistant fireman had similar symptoms.

We (Dr. Peoples) asked this assistant about the report dated December 31, 1975, by one of the firemen in his summary of the Telone II chemical spill where two firemen tested the breathing apparatus used at the scene. The report stated: One fireman fell quickly unconscious and the second was made dizzy and nauseated. This assistant corroborated the incident except he said that the fireman was very dizzy and fell but he did not think that he became completely unconscious.

The exposed CHP men were given medical care by a third physician after

their discharge from the Sutter General Hospital on October 22, 1975, and he turned in Doctor's First Report of Work Injury on four CHP officers. In each case the symptoms were tightness of the chest, headache, and eye irritation. Some records stated that there were harsh basal sounds in the chest and in the case of one there was a red edematous throat, not noted in the others.

On November 21, 1975, in a telephone conversation to us (Dr. Peoples), this third treating physician said that he eventually treated nine CHP men and was examining them at intervals to see if they developed delayed toxicity. He said that the acute symptoms were wheezing, a tight feeling in the chest, skin and eye irritation. He said some patients had experienced mental confusion for 24 hours after the exposure with loss of memory and difficulty in selecting proper words to carry on a conversation. After this cleared up, none had any residual mental problems or change in personality. He treated all the cases with steroids and antibiotics at the suggestion of a physician-toxicologist he had contacted in San Francisco. He had arranged for laboratory tests for liver and kidney disfunction and although the SGOT was elevated for two to three days, he didn't think there was any significant liver damage. The BUN was normal in every case.

On December 5, 1975, in a letter from an official of the CHP to a chemical company physician, he stated:

"Approximately two weeks following the incident, two of the firefighters involved conducted a test of their breathing apparatus. One quickly dropped unconscious and the other was

considerably affected. Both were hospitalized again for a short time, then released. This symptom is interesting because I can find no reference in anyone's safety guides or labels concerning unconsciousness caused by these fumes, and this was the third such incident. And, of course, there was little or no dissipation of the Telone II fumes from the rubber masks on the air tanks. I don't know if they had been decontaminated.

"Apparently only one of my officers is still experiencing difficulty and he was by far the most severely affected during the incident. He still has an occasional period of discomfort but the prognosis is that he will fully recover. As the principal investigating officer, he was exposed to the Telone II more closely and for a longer duration than most others without protective clothing. His contact and subsequent problems are of interest because of so many inconsistencies (at least from the fireman's view). The fumes were not offensive or especially irritating at the scene, and he took little notice of them. Approximately one hour after leaving, his hands and face began to burn, but he didn't develop respiratory problems until two and one-half to three hours following exposure.

"However, from this point he had great pain and discomfort with every breath. This condition gradually cleared over the next two weeks much as recovery from pneumonia. The medication prescribed by his physician, acting on information

"provided by Dr. is clearly responsible for his continuing recovery."

On December 6, 1975, we (William Thomas) spoke with an official of the CHP who stated that one officer still seemed to show adverse effects of the Telone II exposure and has missed work.

On January 7, 1976, we (William Thomas) spoke with an official of the CHP who said that this officer has been returned to "full duty status" although he is being limited to daytime shifts so as "to monitor his job performance." He said this officer now has problems in relating to other persons on the job.

On April 8, 1976, we (Dr. Peoples) talked with a CHP official who stated that this officer had then been on "full duty status" for some time although he had some residual effects noted by how he related to other persons while on the job. This official did not seem to want to discuss these problems with us (Dr. Peoples). All the other officers who were exposed were reported as in normal health and had no complaints as of that date.

We (Dr. Peoples) contacted the third physician by telephone on April 26, 1976, and asked about the present health of the CHP officers, and the one officer in particular. This physician told us that during the first two to four days (not 24 hours as previously stated) all the men suffered from mental changes characterized by irritability, loss of memory, and difficulty in finding the desirable words to carry on a conversation. This condition was not noted by the men while they were

experiencing it, but was recalled separately by the men after the condition cleared up. These observations were also reported to this physician by some of the exposed men's wives. Other than the one man, he said, none of the men had had any mental or nervous problems since that time. This physician had examined all the men at three months post-exposure and six months post-exposure. He has used laboratory tests, X-rays and physical examinations to study this group of men and said that he was inclined to consider them all normal by April 1, 1976.

He then said that the one officer in question had had asthma problems when a child and it took him two weeks to get over the lung damage after the Telone II exposure incident. On April 20, 1976, this same officer came in to see him complaining about his lungs. This third physician gave him extensive pulmonary tests; the results were in the normal range. The officer also complained about a nervous condition which this physician described as "tension" and discounted its importance. He said it may not have been related to the Telone II exposure. This officer said his wife has not complained to him about this "tension" at any time.

It was clear that this third physician was not aware of the reason why this officer was put on duty with restrictions (daytime only so he could be monitored) until January or whether his alleged continuing nervousness or "tension" was related to it.

An official of the CHP Headquarters Personnel Office in Sacramento advised one of us (Dr. Peoples) on April 27, 1976, that he had on that date contacted an official of the Yuba City CHP office concerning

current job performance of any patrolmen who had been exposed in the Telone II incident. This official said that only one of the CHP officers exposed at the Telone II spill was still having problems. This individual was said to have had some personality defects before the accident, but fellow officers now state that he has had a change in his personality since the exposure incident. They said he complained of severe headaches for several weeks after the accident but that he had not been complaining of them recently. This official then said at that time this officer had minimal difficulties in carrying out his assigned duties and had no serious health problems. This personnel official said that the local CHP official was trying to be as helpful as possible but was choosing his words very carefully in describing the officer's work performance.

DISCUSSION

A review of Doctor's First Report of Work Injury for 1974 and 1975 of injuries to workers exposed to pesticides containing 1,3-dichlorpropene, such as Telone, Telone II, Telone C, and D-D, indicate that the effects of modest exposure is to cause irritation of the skin, eyes, and respiratory tract. These modest injuries respond to treatment without residual effects or delayed toxicity.

In the two serious spill incidents described, several individuals were exposed to high concentrations of Telone and Telone II for a considerable length of time and showed both acute and delayed effects on the nervous system. Three men fell unconscious and had convulsions at the scene of the spill. The delayed effects were shown by many individuals who were dizzy for 24 hours and suffered severe headaches over several

days and a few cases which have shown changes in personality characterized by anxiety, easy fatiguability, irritability, and sexual impotence.

The animal toxicity data indicate that the compound has the capability of causing chemical pneumonia and lung hemorrhage on prolonged inhalation to high concentrations. One individual at the Yuba City highway spill was diagnosed as having pneumonia lasting a week.

It appears that 1,3-dichloropropene, when inhaled or absorbed through the skin in sufficient amount, can produce serious acute and chronic toxicity to the nervous system. It appears that all the safety instructions for products containing this compound should include this warning; "If a spill occurs, do not enter the area without full protective clothing, and then only for short periods of time."

A change to a more restrictive DOT classification should be considered on the basis of the hazard of this chemical to respiration and effects on the central nervous system from inhalation or dermal exposure. It appears that the present classification reflects the more modest hazard of oral toxicity.

The labels of all the pesticides that contain 1,3-dichloropropene should take into account the possibilities of severely adverse effects upon human health in the event of substantial exposure of humans. The use precautions should advocate closed system handling. The fact that this chemical readily passes through rubber and vinyl and that polyethylene gloves and protective gear are needed, should be emphasized. The highly

corrosive nature of this chemical to metal and all hoses except those made of polyethylene needs to be emphasized so that equipment deterioration and consequent human exposures can be minimized. The 45 labels of pesticides in use in California in 1975 that contain this chemical were reviewed; none were found to adequately reflect these hazards or how to prevent them.

Additional biologic studies of short-term and long-term effects of exposure to this chemical should be undertaken to evaluate its potential for damage to the central nervous system and the possible development of changes in behavior.

Computer Printout of Pesticides
Registered for Use in California
that Contain
1,2-Dichloropropane
and
1,3-Dichloropropene
as Well as a Printout
of Those that Contain Only
Dichloropropenes

1,2-DICHLOROPROPANE & 1,3-DICHLOROPROPENE

PAGE 001

SEARCH NO. 01
DATE 01/07/76
ACTIVITY

STATUS 0
TYPE
USE
WARNING
FORM
CHEMICAL 00185
CLASS 19
CHEMICAL
CLASS
STATUS
CMDY

AMVAC CHEMICAL CORP

4100 E WASHINGTON BLV
LOS ANGELES, CA 90023

05481 50179 AA FUM-A-CIDE 15-D

05481 50184 AA FUM-A-CIDE 30-D

B F CHEMICAL COMPANY

11609 S HEREFORD RD
LOS BANOS , CA 93635

10938 50003 AA VIDDEN D SOIL FUMIGANT

BAKERSFIELD AG-CHEM, INC.

RT. 1, BOX 858
BAKERSFIELD, CA 93308

11369 50013 AA BAC-FUME D SOIL FUMIGANT

BRITZ CHEMICAL CO

P O BOX 366
FIVE POINTS, CA 93624

10951 50040 AA BRITZ BRAND VIDDEN D SOIL FUMIGANT

BROWN & BRYANT INC

P O BOX T
SHAFTER , CA 93263

11373 50003 AA BEEBEE D-D SOIL FUMIGANT

CASTLE A L INC

P O BOX 877
MORGAN HILL, CA 95037

10972 50007 AA CASTLE BRAND D-D SOIL FUMIGANT

COASTAL AG-CHEM

P O BOX 1307
OXNARD , CA 93030

08469 50121 AA COASTOX D-D SOIL FUMIGANT

DOW CHEMICAL COMPANY, THE

2030 DOW CENTER
MIDLAND , MI 48640

00464 00239 ZA VIDDEN D

00464 00392 AA VIDDEN DC-15

00464 00511 AA TELONE II SOIL FUMIGANT

GREAT LAKES CHEMICAL CORP., DR. L. VERNON WHITE

P. O. BOX 2200
WEST LAFAYE, IN 47906

05785 00027 AA TERR-O-GAS 57/43T

05785 00033 AA TERR-O-CIDE 15-D

05785 00036 AA TERR-O-CIDE 30-D

LESCO SEED & CHEMICAL INC

P O BOX 148
WATSONVILLE, CA 95076

11079 50020 AA LESCO D-D SOIL FUMIGANT

11079 50021 AA LESCO D-C FUMIGANT 70-30
11079 50022 AA LESCO D-C FUMIGANT 85-15
11079 50025 AA LESCO TELONE II

NAMCO CHEMICALS, A SUBSIDIARY OF ALLIED EQUITIES
CORP ATTN DENNIS PROBER
P O BOX 319
MILPITAS , CA 95035

05316 00034 AA NAMCO PICTEL

NOR-AM AGRICULTURAL PRODUCTS, INC

20 N WACKER DR
CHICAGO , IL 60606

02139 00055 AA VORLEX

OCCIDENTAL CHEMICAL COMPANY DIVISION OF OCCIDENTAL
PETROLEUM CORPORATION
P O BOX 198
LATHROP , CA 95330

07001 50379 AA NEMATOCIDE D-D

PUREGRO COMPANY

1052 W SIXTH ST
LOS ANGELES, CA 90017

01202 50206 AA PUREGRO VIDDEN D

SHELL CHEM COMPANY AGRICULTURAL DIVISION PESTICIDE
REGULATIONS DEPARTMENT
2401 CROW CANYON ROAD
SAN RAMON , CA 94583

00201 00119 AA D-D SOIL FUMIGANT

00201 00350 AA D-D/PIC SOIL FUMIGANT

SOIL CHEMICALS CORPORATION

P O BOX 531
MORGAN HILL, CA 95037

| | |
|----------------|-------------|
| 08536 00008 AA | PIC-CLOR-60 |
| 08536 00010 AA | BROM 70/30 |
| 08536 50014 AA | PIC-CLOR-30 |
| 08536 50017 AA | PIC-CLOR-35 |

SOILSERV INC

P O BOX 1817
SALINAS , CA 93901

| | |
|----------------|----------------------------|
| 06973 50006 AA | SOILSERV D-D SOIL FUMIGANT |
|----------------|----------------------------|

TAYLOR JOHN FERTILIZERS CO

P O BOX 15289
SACRAMENTO , CA 95813

| | |
|----------------|----------------------------------|
| 07729 50018 AA | JOHN TAYLOR CHEMICALS FUMIGANT D |
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TRI-CAL INC

P O BOX 2
MORGAN HILL, CA 95037

| | |
|----------------|----------------|
| 11220 50008 AA | TRI-FORM 40/60 |
| 11220 50011 AA | TRI-CON D |

WALKER AG CO, INC

P.O.DRAWER G
MERRILL , OR 97633

| | |
|----------------|-------------------|
| 50766 50001 AA | D-D SOIL FUMIGANT |
|----------------|-------------------|

WILBUR-ELLIS COMPANY

P O BOX 1286
FRESNO , CA 93715

| | |
|----------------|---------------------------------|
| 02935 50090 AA | RED-TOP D-D SOIL FUMIGANT |
| 02935 50135 AA | RED-TOP TELONE II SOIL FUMIGANT |

DICHLOROPROPENES

SEARCH NO. 02
DATE 01/07/76
ACTIVITY

STATUS 0
TYPE
USE
WARNING
FORM
CHEMICAL 00573
CLASS 19
CHEMICAL
CLASS
STATUS
CMDY

B F CHEMICAL COMPANY
11609 S HEREFORD RD
LOS BANOS , CA 93635

10938 50004 AA TELONE SOIL FUMIGANT

BAKERSFIELD AG-CHEM, INC.
RT. 1, BOX 858
BAKERSFIELD, CA 93308

11369 50054 AA TELONE

BREA AGRICULTURAL SERVICE-KERMAN

P O BOX 493
KERMAN , CA 93630

10950 50003 AA TELONE SOIL FUMIGANT

BRITZ CHEMICAL CO

P O BOX 366
FIVE POINTS, CA 93624

10951 50039 AA TELONE

BROWN & BRYANT INC

P O BOX T
SHAFTER , CA 93263

11373 50047 AA TELONE SOIL FUMIGANT

COASTAL AG-CHEM

P O BOX 1307
OXNARD , CA 93030

08469 50070 AA COASTOX TELONE

DIAMOND LABORATORIES INC

P.O. BOX 863
DES MOINES , IA 50304

06175 00004 AA 05265 PET DUST

DOW CHEMICAL COMPANY, THE

2030 DOW CENTER
MIDLAND , MI 48640

00464 00240 ZA TELONE SOIL FUMIGANT

00464 00379 AA TELONE C

GASSER & DUNHAM

P.O. BOX 527
MERRILL , OR 97633

11261 00002 AA GASSER & DUNHAM TELONE SOIL FUMIGANT

LESCO SEED & CHEMICAL INC

P O BOX 148
WATSONVILLE, CA 95076

11079 50023 AA TELONE SOIL FUMIGANT

OCCIDENTAL CHEMICAL COMPANY DIVISION OF OCCIDENTAL
PETROLEUM CORPORATION

P O BOX 198
LATHROP , CA 95330

07001 00117 AA

TELONE

PAGE 007

PUREGRO COMPANY

1052 W SIXTH ST
LOS ANGELES, CA 90017

01202 00180 AA

PUREGRO TELONE SOIL FUMIGANT

01202 50305 AA

PUREGRO TELONE II SOIL FUMIGANT

ROCKWOOD CHEMICAL CO

P O BOX 34
BRAWLEY , CA 92227

10226 00011 AA

TELONE

SOIL CHEMICALS CORPORATION

P O BOX 531
MORGAN HILL, CA 95037

08536 50015 AA

PIC-BROM 67

08536 50016 AA

PIC-CLOR-15

STOKER CO

P O BOX 2010
EL CENTRO , CA 92243

06023 50039 AA

TELONE SOIL FUMIGANT

TAYLOR JOHN FERTILIZERS CO

P O BOX 15289
SACRAMENTO , CA 95813

07729 50052 AA

JOHN TAYLOR CHEMICALS TELONE

TOXO SPRAY-DUST INC.

P O BOX 321
TUSTIN , CA 92680

00464 00240 AA 11219

TOXO SOIL FUMIGANT TELONE

VAN WATERS & ROGERS

PO BX 3200 RINCON ANX
SAN FRANCISCO, CA 94119

00550 50019 AA

GUARDSMAN TELONE SOIL FUMIGANT

WEST STANISLAUS GROWERS ASSN

P O BOX 38
WESTLEY , CA 95387

11240 50002 AA

TELONE

WILBUR-ELLIS COMPANY

P O BOX 1286
FRESNO , CA 93715

02935 50071 AA

TELONE SOIL FUMIGANT

Some Representative Labels of Pesticides
Registered in California that Contain
1,3-Dichloropropene
(Telone, Telone C, Telone II, DD)

LENOVO*

CONTROLS MANY PLANT PARASITIC NEMATODES

Active Ingredients: 100%

1,1,2-Dichloropropane and Related Chlorinated Hydrocarbons
U.S.D.A. Registration No.

GENERAL INFORMATION

Use JOHN TAYLOR CHEMICALS TELONE only as a preplanting soil fumigant to control nematodes, such as meadow (lesion), rootknot, citrus burrowing, ring, spiral, sting, pin, stubby root, styler, danner and cyst formers (golden and sugar beet) and certain other plant pathogens. TELONE is also used to control wireworms and garden centipedes (symphyla). Fumigate land to be planted to the crops listed below, under the conditions, and at the rates indicated under DIRECTIONS FOR USE, DOSAGE RECOMMENDATIONS, and PRECAUTIONS.

Vegetabilia Cerealia:

| | | | | |
|-----------------|----------|-------------|------------|-----------------|
| apricot | celery | horseradish | parsnip | shellfish |
| bean | chive | kale | pea | spinach |
| beet | collard | kohlrabi | peppermint | squash (winter) |
| black-eyed pea | corn | leek | pepper | squash (summer) |
| broccoli | cress | lettuce | potatoes | sweet potatoes |
| broccoli sprout | cucumber | marjoram | pumpkin | swiss chard |
| carrot | eggplant | mint | radish | turnip |
| carrot | garlic | onion | rutabaga | watermelon |
| cantaloupe | potato | parsley | salsify | watermelon |

| | |
|-------------|---------------|
| flox | pasture grass |
| grasses | jasmint |
| hopi | tiger cane |
| leopardazis | tobacco |
| millet | vetch |
| milfo | wheat |
| oats | |

| citrus fruit tree planting sites: | deciduous fruit and nut tree planting sites: | citrus fruit tree planting sites: | deciduous fruit and nut tree planting sites: |
|-----------------------------------|--|-----------------------------------|--|
| grapefruit | almonds | lemons | limes |
| apple | fig | quince | oranges |
| apricot | apple | plum | tangerine |
| cashew nut | hazelnut | prune | plum |
| | | peach | persimmon |
| | | pear | quince |

Shrub and Vine Planting Sites:

| | |
|---------------|--------------|
| cherries | persimmons |
| chmons | walnuts |
| hackberry | |
| hackberries | hackberries |
| blackberries | blackberries |
| boysenberries | raspberries |
| cranberries | strawberries |
| grapes | |

Forage Crops including flax plants, ornamentals, shrubs and bushes; forest, shade, fruit and nut trees and vine and bromeli fruit of all types.

DIRECTIONS FOR USE

WHEN TO TREAT: Treat either in spring or fall, whenever soil conditions permit. For best results, with annual crops treat soil each year. Do not use JOHN TAYLOR CHEMICALS TELONE on extremely heavy clay soils. In northern states, late summer or early fall treatment (before October 15), is best for land to be planted to early spring crops. In this case, the plants are to be set out, such as celery, fennel, parsley, etc., in the fall. In the spring, early treatment permits planting a fall cover crop.

SOIL PREPARATION: For best fumigant penetration and sealing, plant remains should be incorporated into the soil long enough before treatment so that the roots are well rotted. The soil should be in good seedbed condition, free of clods and undecomposed plant material with a soil temperature between 40° and 80° at the depth of injection, and with enough moisture for good seed germination. Deep tillage, 12 to 18 inches, often improves results. Treat loams and clay loams when fairly dry (water content, one-half of field capacity).

APPLICATION: For overall application, either chisel (with chisel per foot or two) or wheel-and-scraper equipment may be used. For new applications, use one chisel per row or two chisels spaced 12 inches apart. Where 2 or more chisels are used per row apply at the same rate as for one chisel. As the distance between rows is increased the amount of fumigant required will increase. For wheel-and-scraper application, use 100 lb. of fumigant per acre. As the distance between rows is increased, the amount required per acre will increase. Mark the treated strips by bedding or lifting or by other means. The fumigant flow to distribute about 1½ times as much per chisel as overall application. Use a single chisel to treat 8 ft. wide rows. When using a wheel-and-scraper, use the fumigant chisel mark. Always inject the fumigant at least 6 to 8 inches below the surface.

NOTICE: This document contains information which is exempt from release under the provisions of the Freedom of Information Act, 5 U.S.C. 552. It is being furnished to you for your information only. It is not intended for distribution outside your agency.

NOTICE: The statements made on this label, or by any of our agents concerning this material, are given for information only. They are believed to be true and accurate, but because conditions of use which are of critical importance are beyond its control, John Taylor Fertilizers Co. does not make, nor does it authorize any agent or representative to make, any warranty, guarantee or representation, express or implied, concerning this material, except that it conforms to the chemical description on the label. Neither John Taylor Fertilizers Co. nor the seller shall be held responsible in any manner for personal injury or property damage or other type of loss resulting to the buyer or to any person from the handling, storage or use of this material when used contrary to the label directions. The buyer assumes all risk and liability resulting from such handling, storage or use and uses this material under these conditions.

1914

JOHN TAYLOR FERTILIZERS CO.
POST OFFICE BOX 15789
SACRAMENTO, CALIFORNIA 95813

Clean, Clear, Non-Nozzle Clogging
SOIL FUMIGANT
AND OTHER SOIL PESTS IN CROP LANDS

final soil surface. In western irrigated cotton areas, use 2 chisels per row, set 12 inches apart, and plant in the middle of the treated strip.

SEALING: Immediately after application, compact the soil. After chisel application, use a disc harrow, disc roller, cultipacker or similar sealing device. After plow-soil application, disk the land, then use a disc harrow or disc roller. When using a roller, be sure the roller is in contact with the furrow bottom. Sealing after row application can be accomplished by the tractor wheel, by luting, or by bedding; so that the fumigant will be 12 to 14 inches below the top of the bed. When fumigating lined rows, seal in the fumigant with ring rollers or press sealers.

EXPOSURE PERIOD: After application and compacting, leave tail undisturbed for 7 to 14 days. Wet soil retards diffusion of fumigant, requiring a longer exposure period.

[illegible]

DOSEAGE RECOMMENDATIONS

To Control Nematodes, Symplyons and Wireworms

| Group (consult list of indigenous plants for additional information) | Type of Treatment | Soil Type | Gallons Per Acre | Linear Feet Per Foot Per Chisel | | |
|---|--|---------------|-----------------------|---------------------------------------|-------|-------|
| Shallow Rooted Plants: Field Crops Pasture Crops Grain and Turf Crops Vegetables Ornamentals | Row (or Band) (42") | Mineral | 6 to 8 | 260 to 195 | | |
| | | Muck or Peat | 12 to 16 | 130 to 97 | | |
| | Over-all (or Broadcast) | Mineral | 12 to 20 ² | 455 to 273 | | |
| | | Muck or Peat | 32 ² to 48 | 170 to 114 | | |
| Strawberries Sugar Beets Root-Knot Nematode | Over-all | Mineral | 32 to 48 | 170 to 114 | | |
| | Row (42") | | 7 | 273 | | |
| | Over-all | Mineral | 15 to 20 | 363 to 223 | | |
| | Row (42") | | 12 | 130 | | |
| Sugar Beet Nematode | Over-all | | 15 to 25 | 363 to 218 | | |
| | Row | Mineral | 30 to 60 | | | |
| Pineapple ^a | Over-all | Mineral | 40 | 136 | | |
| Citrus — Florida, ¹ Nursery and Field; Citrus Fruit Trees Deciduous Fruit Trees Forest Trees Grapes Nut Trees Ornamentals (deep rooted) | Over-all: Gallons Per Acre to Penetrate Various Depths | | | | | |
| | | Mineral Soils | 3 ft. | 4 ft. | 5 ft. | 6 ft. |
| | | Sand | 20 | 28 | 36 | 44 |
| | | Sandy loam | 36 | 40 | 48 | 64 |
| | | Silt loam | 56 | 68 | 84 | 106 |
| | | Clay Loam | 72 | 92 | 112 | 136 |
| | | | | | | |

Use the higher rate in heavier soil.
For fast-forming nematodes increase dosage to 23 gallons (218 linear feet per pint per chisel.)
For each soil containing less than 30% organic matter use 25 gallons per acre.
For Hawaiian pineapples, application may be made at time of, or just before planting.
For burrowing nematode in citrus infect on 18-inch variety 12 inches deep. Keep tree of plants susceptible to burrowing nematodes for 2 years before replanting to eluate.

NOTE: To control symphylans (garden centipedes) use only over-all at 25 or more gallons per acre, and apply during late summer or early fall when the soil is warm. To control wireworms use dosages recommended for nematodes in over-all or broadcast treatments.

| NET CONTENTS | GALLONS | LOT NO. |
|--------------|---------|---------|
| 100 | 1 | 100 |
| 200 | 2 | 200 |
| 300 | 3 | 300 |
| 400 | 4 | 400 |
| 500 | 5 | 500 |
| 600 | 6 | 600 |
| 700 | 7 | 700 |
| 800 | 8 | 800 |
| 900 | 9 | 900 |
| 1000 | 10 | 1000 |
| 1100 | 11 | 1100 |
| 1200 | 12 | 1200 |
| 1300 | 13 | 1300 |
| 1400 | 14 | 1400 |
| 1500 | 15 | 1500 |
| 1600 | 16 | 1600 |
| 1700 | 17 | 1700 |
| 1800 | 18 | 1800 |
| 1900 | 19 | 1900 |
| 2000 | 20 | 2000 |
| 2100 | 21 | 2100 |
| 2200 | 22 | 2200 |
| 2300 | 23 | 2300 |
| 2400 | 24 | 2400 |
| 2500 | 25 | 2500 |
| 2600 | 26 | 2600 |
| 2700 | 27 | 2700 |
| 2800 | 28 | 2800 |
| 2900 | 29 | 2900 |
| 3000 | 30 | 3000 |
| 3100 | 31 | 3100 |
| 3200 | 32 | 3200 |
| 3300 | 33 | 3300 |
| 3400 | 34 | 3400 |
| 3500 | 35 | 3500 |
| 3600 | 36 | 3600 |
| 3700 | 37 | 3700 |
| 3800 | 38 | 3800 |
| 3900 | 39 | 3900 |
| 4000 | 40 | 4000 |
| 4100 | 41 | 4100 |
| 4200 | 42 | 4200 |
| 4300 | 43 | 4300 |
| 4400 | 44 | 4400 |
| 4500 | 45 | 4500 |
| 4600 | 46 | 4600 |
| 4700 | 47 | 4700 |
| 4800 | 48 | 4800 |
| 4900 | 49 | 4900 |
| 5000 | 50 | 5000 |
| 5100 | 51 | 5100 |
| 5200 | 52 | 5200 |
| 5300 | 53 | 5300 |
| 5400 | 54 | 5400 |
| 5500 | 55 | 5500 |
| 5600 | 56 | 5600 |
| 5700 | 57 | 5700 |
| 5800 | 58 | 5800 |
| 5900 | 59 | 5900 |
| 6000 | 60 | 6000 |
| 6100 | 61 | 6100 |
| 6200 | 62 | 6200 |
| 6300 | 63 | 6300 |
| 6400 | 64 | 6400 |
| 6500 | 65 | 6500 |
| 6600 | 66 | 6600 |
| 6700 | 67 | 6700 |
| 6800 | 68 | 6800 |
| 6900 | 69 | 6900 |
| 7000 | 70 | 7000 |
| 7100 | 71 | 7100 |
| 7200 | 72 | 7200 |
| 7300 | 73 | 7300 |
| 7400 | 74 | 7400 |
| 7500 | 75 | 7500 |
| 7600 | 76 | 7600 |
| 7700 | 77 | 7700 |
| 7800 | 78 | 7800 |
| 7900 | 79 | 7900 |
| 8000 | 80 | 8000 |
| 8100 | 81 | 8100 |
| 8200 | 82 | 8200 |
| 8300 | 83 | 8300 |
| 8400 | 84 | 8400 |
| 8500 | 85 | 8500 |
| 8600 | 86 | 8600 |
| 8700 | 87 | 8700 |
| 8800 | 88 | 8800 |
| 8900 | 89 | 8900 |
| 9000 | 90 | 9000 |
| 9100 | 91 | 9100 |
| 9200 | 92 | 9200 |
| 9300 | 93 | 9300 |
| 9400 | 94 | 9400 |
| 9500 | 95 | 9500 |
| 9600 | 96 | 9600 |
| 9700 | 97 | 9700 |
| 9800 | 98 | 9800 |
| 9900 | 99 | 9900 |
| 10000 | 100 | 10000 |

DANGER

**KEEP OUT OF THE REACH OF CHILDREN
MAY BE FATAL IF INHALED, ABSORBED THROUGH SKIN OR SWALLOWED • CAUSES BURN OF SKIN
COMBUSTIBLE LIQUID**

Year Eye Protection Appropriate to the Circumstances When Handling This Material • Wash Thoroughly after Handling and Before Eating and Smoking • Wash Contaminated Clothing and Air Contaminated Shoes Thoroughly Before Re-use • Keep Away from Heat and Open Flame • Use Only with Adequate Ventilation • Do Not Breathe Vapor.

In case of contact, immediately remove contaminated clothing and shoes and wash skin with soap and plenty of water; for eyes, flush with flowing water for at least 15 minutes and get medical attention.

in case of spillage indoors, have available a self-contained breathing apparatus or mask or respirator of a type posted by the United States Department of Agriculture for chlorinated C₃ hydrocarbons.

Inhaled, remove to fresh air. Use artificial respiration if breathing has stopped. Get immediate medical attention. Keep patient absolutely quiet.

Is swallowed, call a doctor. Induce vomiting by giving an emetic such as 2 tablespoons of table salt in a glass of warm water.

***Telon® Trademark of The Dow Chemical Company**

USE PRECAUTIONS

Important—Note carefully, fumigation may temporarily raise the level of ammonia nitrogen and soluble salts in the soil. This is most likely to occur when heavy rates of fertilizer and fungicide are applied to soils that are either cold, wet, acid, or high in organic matter. To avoid injury to plant roots, fertilize as indicated by soil tests made after fumigation. To avoid possible ammonia injury or nitrate starvation, or both, to crops on high organic soils do not use fertilizers containing ammonium salts and use only fertilizers containing nitrates, until after the crop is well established and the soil temperature is above 63°.

Certain crops including cotton, sugar cane, and pineapple are tolerant to ammoniac and above rule does not apply to them. Lining highly acid soils before fumigation stimulates the growth of certain crops and reduces the possibility of ammoniac toxicity. Certain nursery crops such as citrus seedlings, Cornus sp., Castanopsis sp., spruce and vegetable crops such as cauliflower and lettuce are tolerant to fumigation. To avoid this possible effect, it is suggested that additional phosphate fertilizer be used on soils which tend to be deficient in this nutrient.

CAUTION: To avoid reinfestation of treated soil do not use transplants, tools, or crop remains that could carry soilborne pests from infested land. Clean rig carefully before using.

Since JOHN TAYLOR CHEMICALS TELONE (oil fungicide) is corrosive under certain conditions, flush all applicators with fuel oil or kerosene immediately after use. DO NOT USE HOT WATER. Do not use containers, pumps, or other transfer equipment made of metal with JOHN TAYLOR CHEMICALS TELONE. Do not use applicators, sprayers, or other equipment made of rubber gloves and boots, etc., may be penetrated readily by this material. Polyethylene provides a good barrier. For field operations cover shoes and hands with polyethylene bags. Store JOHN TAYLOR CHEMICALS TELONE in tightly sealed containers to prevent evaporation and leakage. In outside storage, store drums upright to prevent leakage from damaged areas.

Do not store near seeds, plants, fertilizers, or other pesticide chemicals. Do not contaminate foodstuffs.

to avoid injury to fish and other wild life, do not spill or empty fumigant into streams, ponds or other bodies of water.

lines equipment and containers and dispose of wastes by burying in non-crop lands away from water supplies. Containers should be disposed by punching holes in them and burying with wastes.



AGRICULTURAL CHEMICAL

TRANSLATION: (TO THE USER: If you cannot read English, do not use this product until the label has been fully explained to you.)

A Clean, Clear, Non-Clogging Liquid for Preplant Treatment of Crop Lands to Control Plant Parasitic Nematodes and Certain Other Soil Pests

55 GAL/208.1 L

THE DOW CHEMICAL COMPANY
AND SUBSIDIARIES

MIDLAND, MICHIGAN 48640, USA ZÜRICH, SWITZERLAND HONG KONG, BCC
CORAL GABLES, FLORIDA 33134, USA SARNIA, ONTARIO, CANADA

* Trademark of THE DOW CHEMICAL COMPANY

86-1350 PRINTED IN U.S.A. IN SEPTEMBER, 1975
REPLACES SPECIMEN LABEL 86-1350 PRINTED IN MARCH, 1975
DISCARD PREVIOUS SPECIMEN LABELS
REVISION INCLUDES: CORRECTION OF FOURTH SENTENCE IN FIRST
PARAGRAPH UNDER "USE PRECAUTIONS" REGARDING AMMOIA INJURY.

[illegible]

AA



TELONE[®]

SPECIMEN LABEL
SOIL FUNGICIDE AND NEMATOCIDE

For Use in Land to be Planted to
Sweet Potatoes,
Tobacco,
White Potatoes, Onions and Mint

ACTIVE INGREDIENTS:
1,3-Dichloropropene and related isomers..... 85%
Chlorpicrin (Trichloroethylene)..... 15%
Contains 10.6 pounds active ingredients per gallon
U.S.A. Registration No. 484-278

TELONE C soil fungicide and nematocide is a colorless, odorless, non-flammable liquid which can be mixed with water or other liquids. It is used to control soil-borne fungi and nematodes in land to be planted to sweet potatoes, tobacco, white potatoes, onions and mint. It is also used in reducing the damaging effects of soil rot of onions and Venturia wilt of mint.

DIRECTIONS FOR USE

When in Test: Apply TELONE C soil fungicide and nematocide to the soil in the amount of 10 to 15 gallons per acre 2 to 3 weeks before planting the crop. For best results, the soil should be moist and the temperature should be 60°F to 70°F. Do not apply TELONE C to land which has been treated with a soil fungicide or nematocide within 30 days before planting. Do not apply TELONE C to land which has been treated with a soil fungicide or nematocide within 30 days before planting.

Important: Note carefully. The treatment may temporarily reduce the level of oxygen in the soil and cause the plants to wilt. This is not a sign of injury. The plants will recover when the soil is re-aerated. Do not apply TELONE C to land which has been treated with a soil fungicide or nematocide within 30 days before planting. Do not apply TELONE C to land which has been treated with a soil fungicide or nematocide within 30 days before planting.

86-1206 PRINTED IN U.S.A. IN JANUARY 1971

REPLACES SPECIMEN LABEL 86-1206 PRINTED IN MARCH, 1970

REVISIONS INCLUDE: (1) REVISION OF DIRECTIONS FOR

USE TO INCLUDE RECOMMENDATIONS FOR LAND TO BE

PLANTED TO WHITE POTATOES, ONIONS AND MINT.

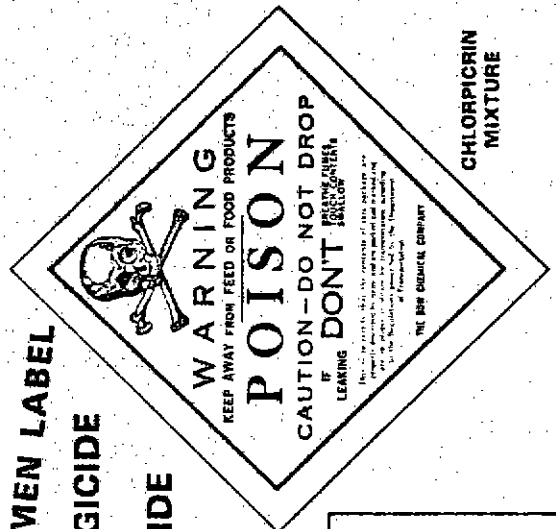
DOSEAGE AND USE RECOMMENDATIONS

| Crop | Type of Treatment | Rate (lb. 10/100 ft. Row) | Rate (lb. 10/100 ft. Row) |
|----------------|-------------------|---------------------------|---------------------------|
| Sweet Potatoes | Pre-plant | 10 to 15 | 100 to 120 |
| | Post-plant | 10 to 15 | 100 to 120 |
| Tobacco | Pre-plant | 10 to 15 | 100 to 120 |
| | Post-plant | 10 to 15 | 100 to 120 |
| White Potatoes | Pre-plant | 10 to 15 | 100 to 120 |
| | Post-plant | 10 to 15 | 100 to 120 |
| Onions | Pre-plant | 10 to 15 | 100 to 120 |
| | Post-plant | 10 to 15 | 100 to 120 |

Important: Note carefully. The treatment may temporarily reduce the level of oxygen in the soil and cause the plants to wilt. This is not a sign of injury. The plants will recover when the soil is re-aerated. Do not apply TELONE C to land which has been treated with a soil fungicide or nematocide within 30 days before planting. Do not apply TELONE C to land which has been treated with a soil fungicide or nematocide within 30 days before planting.

USE PRECAUTIONS

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These applications and containers and disposal of wastes by burning in one place, away from water supplies. Containers should be disposed of by burning in one place, away from water supplies. Containers should be disposed of by burning in one place, away from water supplies.

DANGER

KEEP OUT OF REACH OF CHILDREN
HAZARDOUS LIQUID AND VAPOR
VAPOR EXTREMELY IRRITATING
MAY BE FATAL IF INHALED, ABSORBED THROUGH SKIN OR SWALLOWED
CAUSES BURNS OF SKIN AND EYES
COMBUSTIBLE LIQUID
Do Not Breathe Vapor • Do Not Get In Eyes, on Skin or Clothing • Use Only with Adequate Ventilation
WEAR EYE AND SKIN PROTECTION APPROPRIATE TO CONDITIONS WHEN HANDLING MATERIAL
Wash thoroughly after handling and before eating and smoking. Wash skin with soap and water. If in eyes, flush immediately with plenty of water. If on skin, keep skin cool with water, and obtain medical attention promptly. This material is extremely irritating to the eyes, nose, throat, and skin. It is also extremely irritating to the lungs and may cause severe respiratory distress. It is also extremely irritating to the skin and may cause severe burns. It is also extremely irritating to the eyes and may cause severe eye irritation. It is also extremely irritating to the nose and may cause severe nose irritation. It is also extremely irritating to the throat and may cause severe throat irritation. It is also extremely irritating to the lungs and may cause severe lung irritation. It is also extremely irritating to the heart and may cause severe heart irritation. It is also extremely irritating to the kidneys and may cause severe kidney irritation. It is also extremely irritating to the liver and may cause severe liver irritation. It is also extremely irritating to the spleen and may cause severe spleen irritation. It is also extremely irritating to the pancreas and may cause severe pancreas irritation. It is also extremely irritating to the stomach and may cause severe stomach irritation. It is also extremely irritating to the intestines and may cause severe intestines irritation. It is also extremely irritating to the bladder and may cause severe bladder irritation. It is also extremely irritating to the ureters and may cause severe ureters irritation. It is also extremely irritating to the uterus and may cause severe uterus irritation. It is also extremely irritating to the vagina and may cause severe vagina irritation. It is also extremely irritating to the cervix and may cause severe cervix irritation. It is also extremely irritating to the fallopian tubes and may cause severe fallopian tubes irritation. It is also extremely irritating to the ovaries and may cause severe ovaries irritation. It is also extremely irritating to the uterus and may cause severe uterus irritation. It is also extremely irritating to the vagina and may cause severe vagina irritation. It is also extremely irritating to the cervix and may cause severe cervix irritation. It is also extremely irritating to the fallopian tubes and may cause severe fallopian tubes irritation. It is also extremely irritating to the ovaries and may cause severe ovaries irritation.

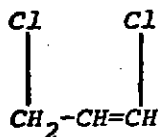
THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN 48040

NET CONTENTS

LOT

Technical Information
on
1,3-Dichloropropene

NAMES: TELONE



1, 3-Dichloropropene

(Contains a mixture of the various combinations of the 1-3 dichloropropenes and related chlorinated hydrocarbons)

TYPE:

Telone soil fumigant is used mainly for nematode and soil insect control.

ORIGIN:

1956 The Dow Chemical Company.

TOXICITY:

LD₅₀ - 250 mg/kg. Burns eyes and skin. Acute vapor toxicity 500 ppm.

FORMULATIONS:

100% liquid.

USES:

Preplant fumigant for the control of nematodes and soil borne insects on vegetables, fruit and field crops. Registered for use on all bush and vine crops, citrus, all deciduous fruit and nut crops, all field crops, strawberries, sugar beets, pineapples, tobacco, grapes, mint, peanuts, vegetable crops, forage crops, small fruit and berries.

IMPORTANT PESTS CONTROLLED:

Nematodes (most species), wire worms, garden centipedes and most other soil insects. Used to control verticillium wilt in mint and potatoes. Other diseases controlled include pink rot of onions, soil rot of sweet potatoes and black root rot, black shank and bacterial wilt of tobacco and pod rot diseases of peanuts.

RATES:

Usually applied at 6-60 gallons actual/acre depending upon the soil type and the crop involved.

APPLICATION:

Preplant application only. Treat either in the spring or fall. Muck soils should be treated in the early fall and planted in the spring. Work the soil into a desired seed bed with adequate moisture for seed germination. Deep tillage of 12-18 inches may improve the results. Soil moisture should be between 40-80°F. Loams and clay loams, however, should be treated when they are relatively dry - (1/2 field capacity).

1. Overall Treatment - Either applied with chisels (12 inches apart) or with plow sole application equipment.
2. Row or band Treatment - Use 1 chisel per row or 2 chisels 12 inches apart. Plant in the middle of the treated area. Inject at least 8 inches deep. Compact the soil immediately after application. Leave the soil undisturbed for 7-12 days. Wait for a longer period in wet soils. However, pineapples may be planted within 2 days of application.

At the end of the exposure period aerate the soil by deep cultivation or plowing. Work the soil several times if heavy rains and low temperature occur during the exposure period. Aeration is usually complete when the odor is gone. Shallow rooted crops can usually be planted within one week of the end of the exposure period. Wait 3-6 months before planting deep rooted shrubs and trees.

PRECAUTION:

Do not use on extremely heavy soil. Do not contaminate lakes, ponds or running water with the chemical. It may temporarily raise the level of ammonia nitrogen and soluble salts in the soil. Avoid reinfestation by not using transplants, infested equipment, etc. which may contain soil born pests. May be corrosive. Flush application equipment immediately with fuel oil or kerosene. Don't apply near desired plants. Previous crop remains should be decomposed before treatment. Allow at least 2-3 weeks between treating and planting.

ADDITIONAL INFORMATION:

Treat every year. For pre-plant use only. Particularly effective against cyst forming and meadow nematodes especially in sandy and loam soils. Effectiveness is influenced less by cold or dry soils than most other soil fumigants.

RELATED MIXTURES:

1. Grandox Fumigant - A soil fumigant sold in Japan containing 25% dichloropropene, 25% dichloronitroethylene and 25% other chlorinated hydrocarbons.

Reports of the Sutter County Spill
of Telone II

on October 21, 1975

Including:

California Highway Patrol Report

Sutter County Fire Marshall Report

Sutter County Agricultural Commissioners Office
Pesticide Illness Investigation Report

Chem Trec's Report of How
They Provided Assistance

Letters Between the California Highway Patrol and
The Dow and Shell Chemical Companies

Newspaper Articles

NOT INCLUDED - CONTAINED
CONFIDENTIAL PERSONAL INFORMATION